

Ohio Academy of Science  
93<sup>rd</sup> Annual Meeting

The Cleveland Museum of Natural History  
And  
Case Western Reserve University

Section of Geology Field Trip

April 29, 1984

Field trip leaders: Dr. Philip Banks, Department of Geological Sciences, Case Western Reserve University, M.E. Williams, Cleveland Museum of Natural History and Tom Lewis, Cleveland State University.

The annual geology field trip will visit various bedrock localities in the Cleveland area, providing a look at some of the intriguing features of these units and reviewing modern theories about their environments of deposition.

The trip will depart at 8:30 a.m. on Sunday, April 29, 1984 from the parking lot on the south side of Adelbert Gymnasium on the Case campus. The trip will last about five hours. Lunch will be provided.

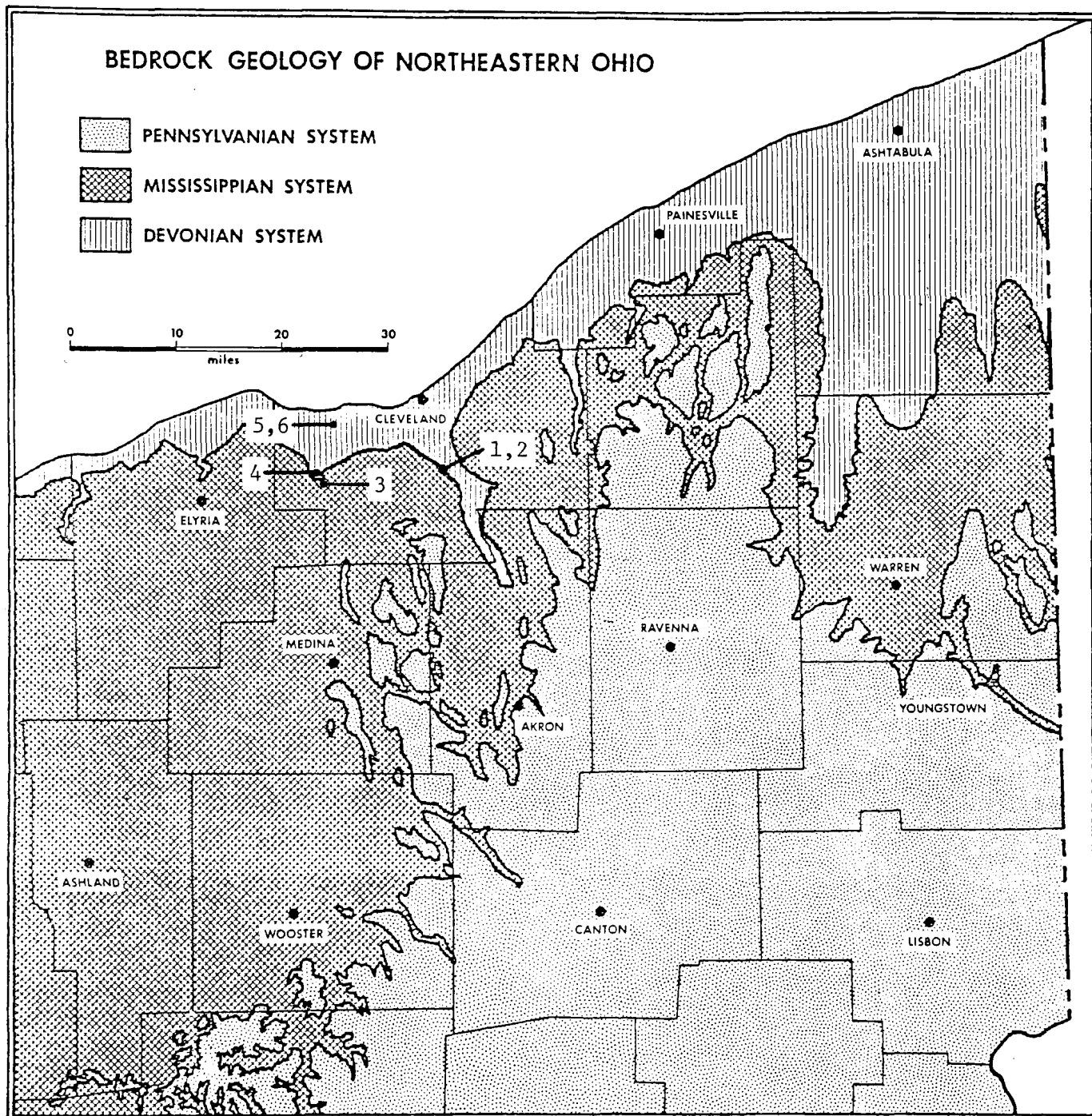
[Information copied from the Annual Meeting Program and notes on guidebook.]

OHIO ACADEMY OF SCIENCE

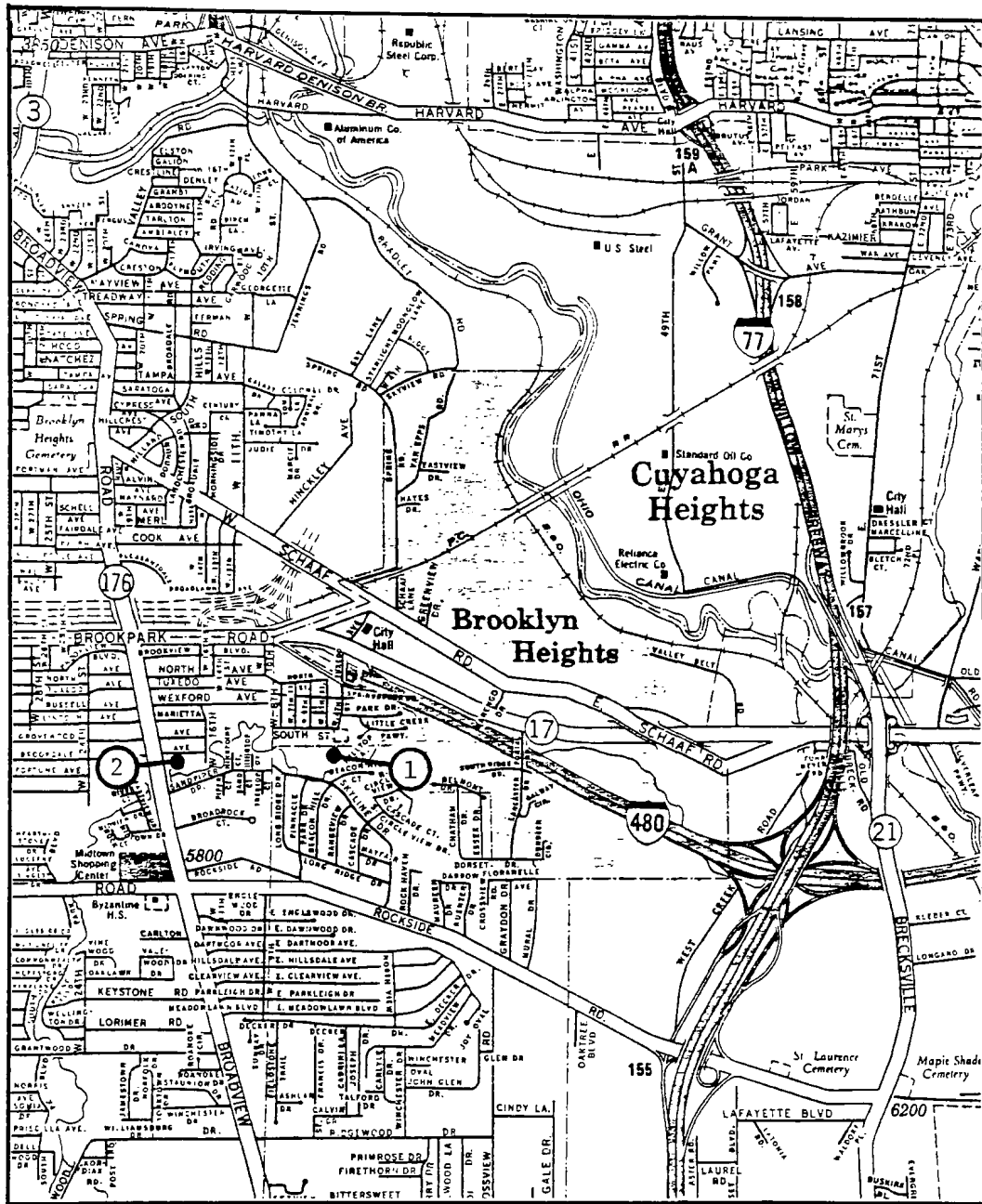
GEOLOGY FIELD TRIP

April 29, 1984

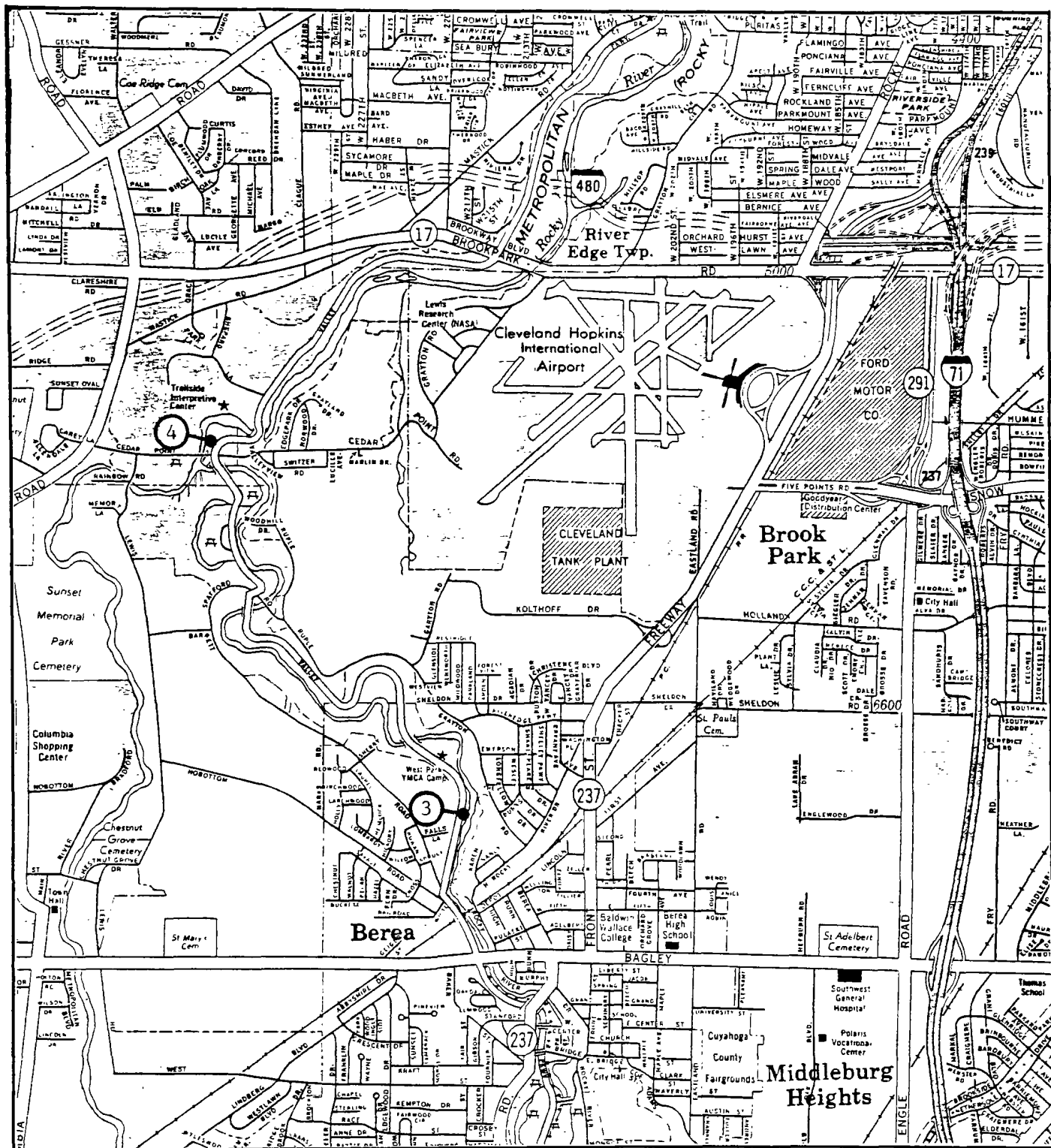
## BEDROCK GEOLOGY OF NORTHEASTERN OHIO



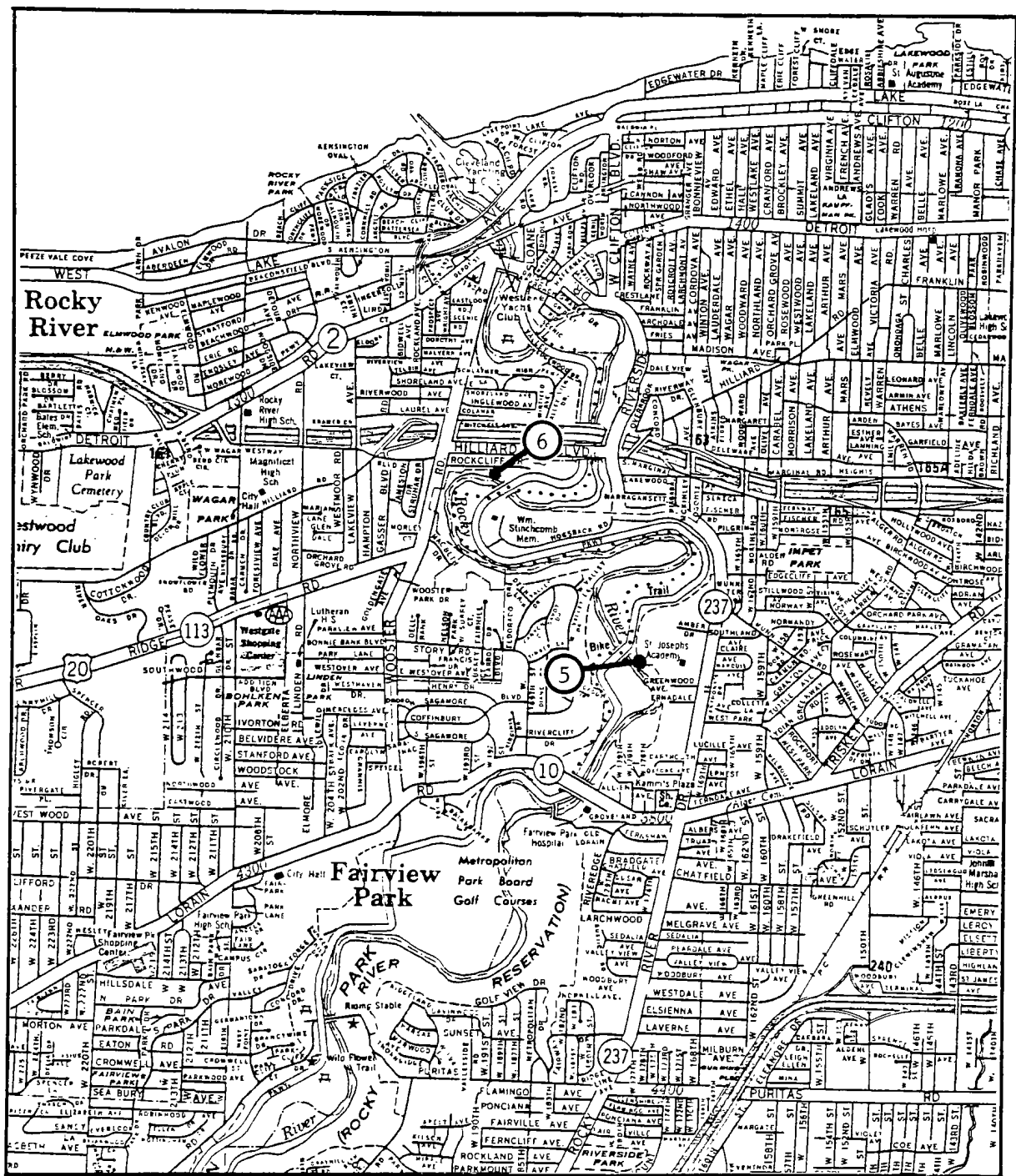
GENERALIZED LOCATION MAP FOR FIELD TRIP STOPS



FIELD TRIP STOPS 1 AND 2



FIELD TRIP STOPS 3 AND 4



OPTIONAL FIELD TRIP STOPS 5 AND 6

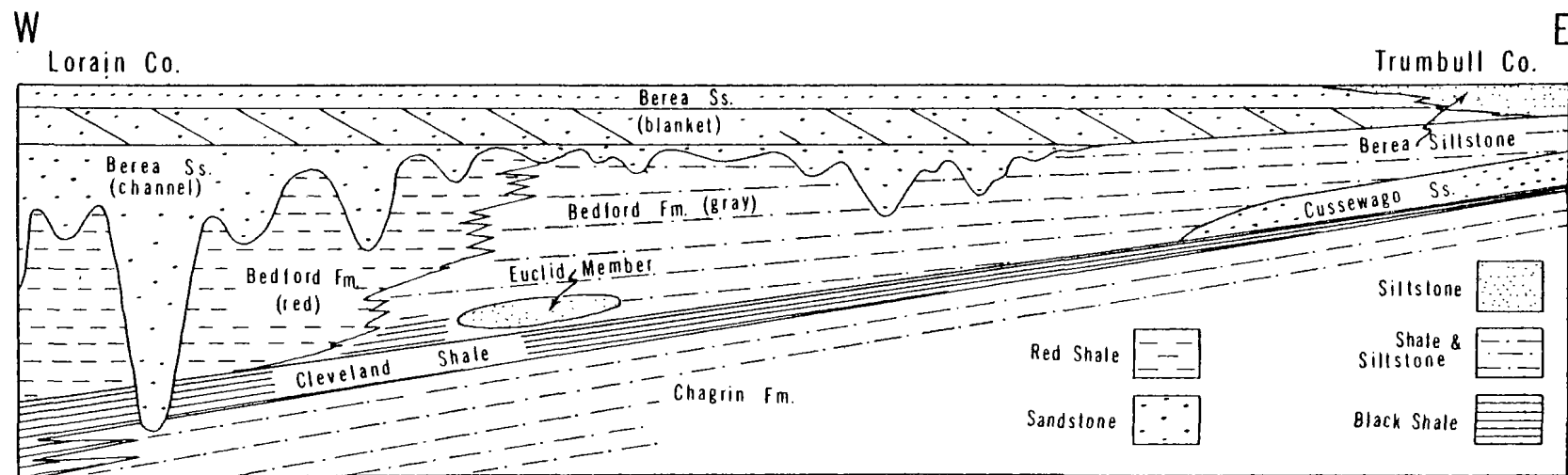


FIGURE 2. Diagrammatic east-west stratigraphic section across northeastern Ohio showing relations of pre-Cuyahoga rock units. Vertical dimension greatly exaggerated.

From Szmuc (1970)

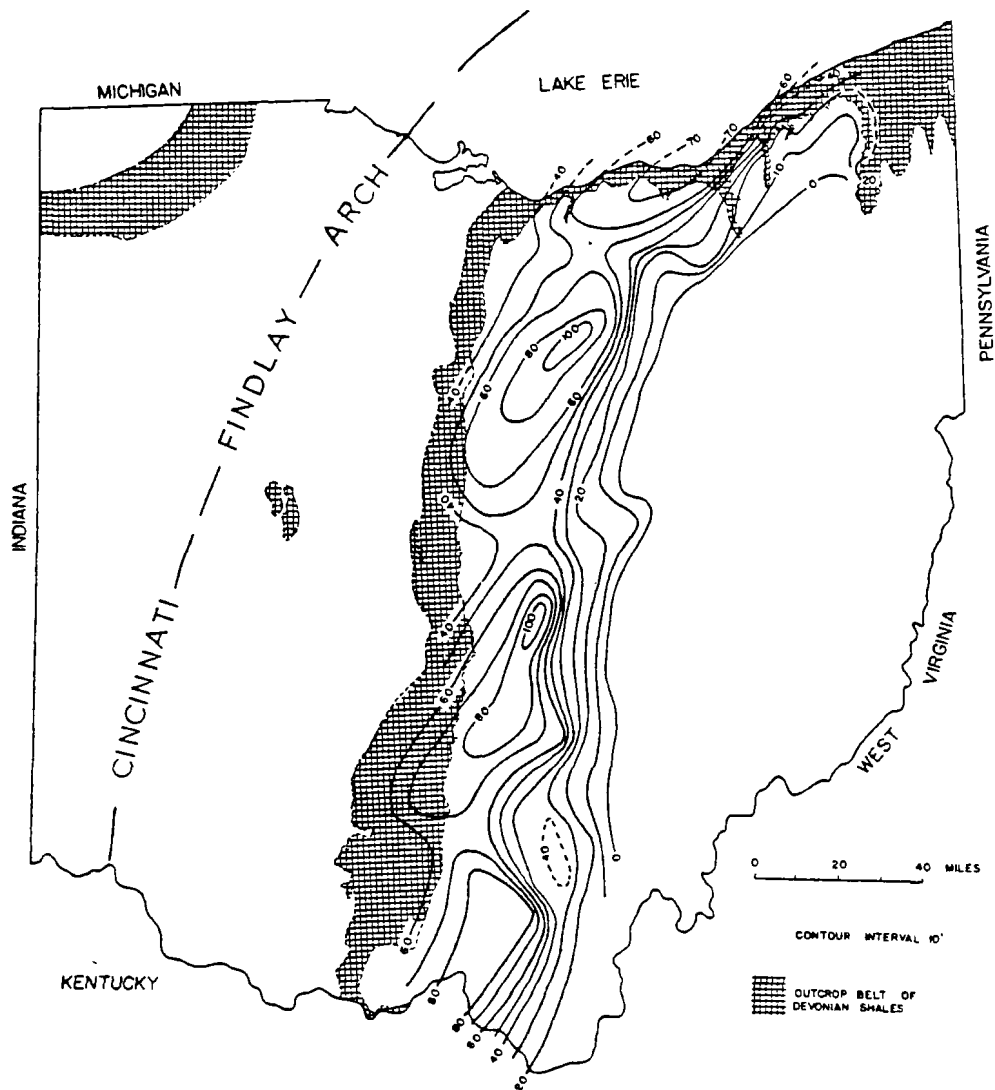
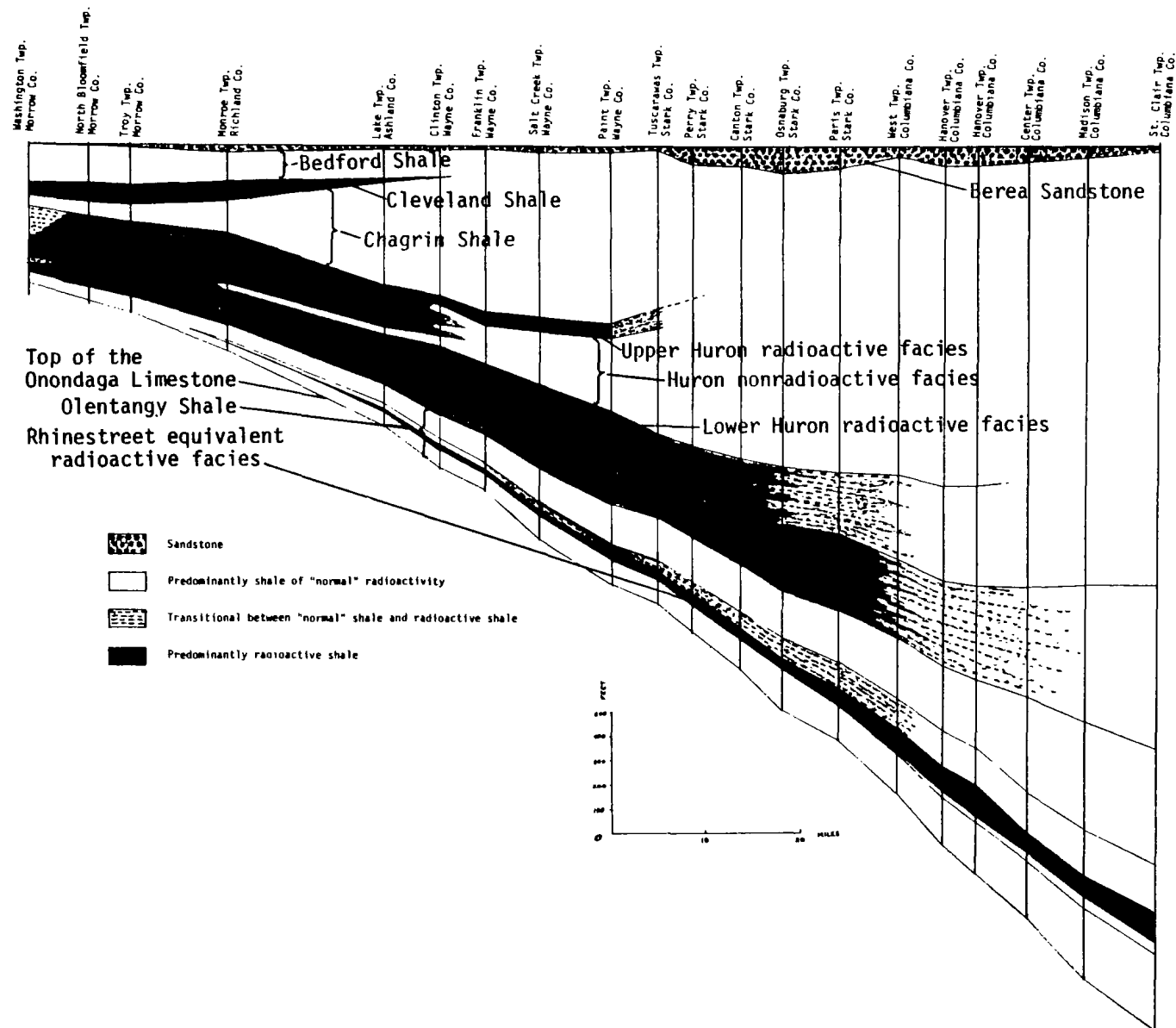


Figure 3. Isopach map of the Cleveland Shale.

From Lewis and Schwietering (1971)














Generalized cross section illustrating the stratigraphic relationships of the geologic units and radioactive facies comprising the Devonian shales sequence in Ohio

From Majchszak (1977)







# STRATIGRAPHIC SECTION AT SKINNER'S RUN

(Stops 1 and 2)

Formation or Member	Thickness	Columnar Section	DESCRIPTION
REDFORD	30'		Dark grey and black shale, bedded siltstones, siltstone "dikes", pyritized siltstone, and large lensoid bodies of disrupted siltstone. Entire unit is highly disrupted and complex both vertically and laterally. Both fissile and "pencil" shale present. Siltstone dikes are highly convolute and cut across bedding. Lensoid silt bodies show evidence of load deformation and possibly channeling. Incomplete. Vegetated at top.
- ? - CLEVELAND	5'		Hard fissile black shale, massive on fresh surface.
	6'		Fissile dark grey shale, weathers to soft clay. Contains rare thin siderite beds.
	9'		Hard fissile black shale, massive on fresh surface.
	5'3"		Fissile dark grey shale showing "ribbed" weathering. Distinct weathering break in outcrop at upper contact.
OLMSTED	1'9"		Three cross-laminated grey siltstones interbedded with dark grey shale. Siltstones show numerous sole marks.
	10'7"		"Ribbed" shale. Hard fissile black shale interbedded with dark grey shale. Larger fraction of dark grey shale in upper half of unit.
	1 1/2 - 4"		Skinner's Run Pyrite Bed. +
CHAGRIN	10'		Grey shale, weathers to sticky grey clay, 95%. Thin siderite beds, hard and stained red, 5%. Incomplete.

# STRATIGRAPHIC SECTION AT ROCKY RIVER/BEREA

(Stop 3)

Formation or Member	Thickness	Columnar Section	DESCRIPTION
REDFORD	20'		Brownish-red shale, soft, weathers to small rectangular chips. Greyish at base grading up through a few feet to brownish-red. Rare thin grey siltstones. Unit strongly folded. Incomplete. Vegetated at top.
	18'		Interbedded dark grey shale and parallel, wavy, and cross-laminated siltstones. Siltstones vary in thickness from 1/3" to 4", and siltstone fraction decreases from 30% at bottom of unit to 5% at top. Unit strongly folded.
	0"-6"		Dark grey bioturbated siltstone. Sharp contacts. Pinches and swells. Unit slightly folded.
CLEVELAND	11'6"		Fissile, black shale. Thickness of unit variable due to encroachment of siltstone "dikes" and "pencil" shale from below. Unit slightly folded.
	6'7"		Grey to greyish-black "pencil" shale, small grey siltstone "pods", and grey siltstone "dikes" Unit slightly folded.
	2'		Fissile, black shale. Unit slightly folded. Incomplete.

# STRATIGRAPHIC SECTION AT ROCKY RIVER/CEDAR POINT

(Stop 4)

Formation or Member	Thickness	Columnar Section	DESCRIPTION
	15'		Covered to top.
CLIFF AND	26'		Hard fissile black shale. Shows "ribbed" weathering, but ribs are closer together and more subdued than underlying unit. Incomplete
?	27'6"		"Ribbed" shale. Interbedded dark grey and black shale. Contacts gradational
	4'6"		Cone-in-cone limestones interbedded with dark grey and black shale. Limestones pinch and swell and are wavy.
OLMSTEAD	19'6"		"Ribbed" shale, also a few scattered cone-in-cone limestones.
	1'		Grey shale, soft when weathered, often contains silty layers at base. Pinches and swells from veneer to 1'
	9'		"Ribbed" shale.
	1"		Grey shale.
	7'2"		"Ribbed" shale.
	1"		Grey shale.
	1'3"		Fissile dark grey shale.
	1"		Grey shale.
	4'		Fissile dark grey shale. Incomplete.

# STRATIGRAPHIC SECTION AT ROCKY RIVER/LORAIN AVE.

(Stop 5)

Formation or Member	Thickness	Columnar Section	DESCRIPTION
OLMSTED	20'		Hard fissile black shale mostly covered by soil and sediment. Vegetated at top.
	3"		Dark grey cone-in-cone limestone
	6'		Hard fissile black shale, massive on fresh surface.
	2"		Grey shale, soft, laterally continuous.
	1'6"		Dark grey shale
	1"		Pyritic siltstone
	19'		"Ribbed" shale. Hard fissile black shale interbedded gradationally with more easily weathered dark grey shale.
	1'1"		Two grey shale layers separated by dark fissile grey shale. Rare amoebaform pyrite blebs in upper grey shale
	17'		"Ribbed" shale.
	2"		Cross-laminated grey siltstone
-?-	1"		Cross-laminated grey siltstone
	3"		Cross-laminated grey siltstone
	3'2"		Fissile grey shale, easily weathered.
	1"		Cross-laminated grey siltstone
	2"		Siderite bed
	21'4"		Fissile grey shale interbedded with cross-laminated grey siltstones in approx. equal fractions. Siltstones vary in thicknesses from 1/2" to 6". Incomplete.
	1"		Siderite bed.
	1"		Siderite bed.
	2"		Siderite bed.
CHAGRIN			

## TOPICS FOR DISCUSSION

Bedrock formations exposed in the Cleveland area consist of shales, siltstones, and sandstones deposited in offshore marine to deltaic environments in Devonian-Mississippian times. Despite the apparent simplicity of these units, numerous points of controversial interpretation have arisen and persisted over the years. Some that you might like to discuss on this trip are listed below, along with a few of the alternative explanations that have been proposed.

### Chagrin Shale

- How do siderite beds form?
  - Diagenetic replacement
  - Precipitation from circulating groundwater
  - Unusual chemistry at the depositional sediment/water interface

### Cleveland Shale

- What was the environment of deposition?
  - Shelf-slope to deep basin, dominated by turbidity currents
  - Shallow-shelf, above base of storm waves
  - Marginal restricted basins
- Why is the organic content so high compared to most shales?
  - Anoxic deep basin
  - Bottom circulation restricted by basin geometry or abundant plant life
  - Excessive organic productivity in overlying water column
  - Climatic effects on currents, upwelling, mixing, and sediment input
- How do pyrite "bone beds" form?
  - Depositional hiatus, pyritization, and reworking as a lag gravel
  - Brief interval of subaerial(?) exposure, followed later by diagenetic pyritization

### Bedford Formation

- What causes some of the Bedford shales to be red?
  - Intermittent subaerial exposure on tidal flats
  - Different source terrain than earlier formations
- Why are some of the Bedford shales and siltstones deformed?
  - Downslope movement of soft sediments
  - Foundering of massive silt or sand bars and lenses into soft muds beneath

### Berea Sandstone

- What is the significance of the so-called channel structures?
  - Post-Bedford pre-Berea erosional unconformity
  - Foundering of sand bodies into underlying muds
- What sort of deltaic environment does the Berea represent?
  - Wave-, tide-, or river-dominated?
  - Is there a possible component of aeolian dune deposits?